



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

III. Solution by W. W. LANDIS, A. M., Professor of Mathematics and Astronomy, Dickinson College, Carlisle, Pa.; H. C. WHITAKER, A. M., Ph. D., Professor of Mathematics, Manual Training School, Philadelphia, Pa.; G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Science, Chester High School, Chester, Pa.; O. S. WESTCOTT, A. M., Sc. D., Principal North Division High School, Chicago, Ill.; CHAS. E. MEYERS, Canton, Ohio; NELSON L. RORAY, Bridgetown, N. J.; CHAS. C. CROSS, Libertytown, Md.; ELMER SCHUYLER, High Bridge, N. J.; J. H. DRUMMOND, LL. D., Portland, Me.; COOPER D. SCHMITT, A. M. University of Tennessee, Knoxville, Tenn.; and the PROPOSER.

Let x = distance above the water, y = the required maximum.

Then $40-x$ is the hypotenuse and $\sqrt{[(40-x)^2 - (20+x)^2]} = 2\sqrt{(300-30x)}$ is the base.

$$\therefore y:x = 2\sqrt{(300-30x)}:20+x.$$

$$\therefore y = \frac{2x_1/(300-30x)}{20+x} = \text{maximum.}$$

Differentiating and reducing we get $(600 - 90x)(20 + x) - 2x(300 - 30x) = 0$.

$$\therefore x^2 + 60x = 400.$$

$$\therefore x = 6.0555128 \text{ feet.}$$

MECHANICS.

63. Proposed by A. H. BELL, Hillsboro, Ill.

From a horizontal support at a distance of 10 feet apart, a beam 5 feet long and 10 pounds weight is suspended by ropes attached to each end. The ropes are 3 and 5 feet respectively, in length. Required the angles made by the ropes and horizontal support. Also the stress upon each rope.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Science and Mathematics, Chester High School, Chester, Pa., and the PROPOSER.

Let $AB=10$, $BC=CD=5$, $AD=3$, $EB=x+y$, $AE=x-y$.

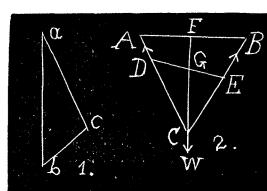
$$\cos AEB = \frac{(x+y)^2 + (x-y)^2 - 100}{2(x+y)(x-y)} = \frac{(x+y-5)^2 + (x-y-3)^2 - 25}{2(x+y-5)(x-y-3)}.$$

$$DF = CN = \frac{100 + (x-y)^2 - (x+y)^2}{20(x-y)}(x-y-3) = \frac{100 + (x+y)^2 - (x-y)^2}{20(x+y)}(x+y-5).$$

$$\therefore xy^3 - xy^2 - (x^3 - 4x^2 + 100)y + 25x = 0 \dots \dots (2).$$

$$\text{Let } 139 - 32x = c, \quad 200 - 8x^2 = 2a,$$

$$79x^2 - 800x + 1500 = b, \quad x^3 - 4x^2 + 100 = d.$$



Now $b=25c-79a/4$ and $d=x^3+a$ in (6)=(7), etc.

$$(316a^2x - 558acx)^2 + (16a^6x - 4c^2x^3 - 4ac^2 - 87acx + 100c^2x) \times \\ (6241a^2x + 316acx^3 + 316a^2c - 400c^2x^3 - 400ac^2 - 16600acx + 100(0c^2x)) = 0 \dots (8).$$

Expanding, we find a common factor c , then by substitution and reduction to the simplest form for the application of Horner's Method.

$$79x^{10} - 1748x^9 + 12559x^8 - 2429.5x^7 - 478451.828125x^6 + 2827762.5x^5 - 4080008.59375x^4 - 27582812.5x^3 + 161863232.421875x^2 - 357007812.5x + 301890625. = 0 \dots (9).$$

Horner's Method gives $x=7.95690209132$, (3) $y=0.564356664799$.

$$x+y=8.521258756118, x-y=7.392545426520.$$

$$CE = 3.521258756118, DE = 4.392545426520.$$

$$\angle DAB = 56^\circ 17' 54'', \angle ABC = 46^\circ 11' 54'', \angle AEB = 77^\circ 30' 12''$$

$$\angle DCE = 59^\circ 3' 32.5'', \angle CDE = 43^\circ 26' 15.5''$$

$$\text{Tension on } BC = \frac{10 \cos DAB}{\sin(DAB + ABC)} = 5.6863 \text{ pounds.}$$

$$\text{Tension on } AD = \frac{10\cos ABC}{\sin(DAB + ABC)} = 7.0896 \text{ pounds.}$$

[Note. By a mistake we published the incomplete solution of this problem in our last issue. Soon after receiving that solution, Dr. Zerr wrote us to the effect that a correct and complete solution would shortly follow. Mr. Bell, being ill at the time, was unable to send the complete solution at the time expected, so that by the time the Department was ready for the press, we forgot about the promised complete solution and sent in the incomplete solution for publication. We have not verified the above solution, and our readers must excuse us from that great task. We hold Dr. Zerr and Mr. Bell responsible for any errors contained in it.—ED. F.]

71. Proposed by the late B. F. BURLESON, Oneida Castle, N. Y.

Three men own a sphere of gold the density of which varies as the square of the distance from the center. If two segments be cut off each one inch from the center of the sphere it will be divided into three parts of equal value. Determine the diameter of the sphere.

II. Solution by R. E. GAINES, A. M., Professor of Mathematics, Richmond College, Richmond, Va.

The element $dydx$ whose ordinate is y will, when revolved about the axis of x generate an infinitesimal ring whose volume is $2\pi ydydx$, and whose distance from the center is $\sqrt{x^2+y^2}$. Therefore for the mass of the minor segment we have

$$2 \int_0^1 \int_0^{\sqrt{a^2 - x^2}} 2\pi y (x^2 + y^2) dy dx = \pi \int_0^1 (a^4 - x^4) dx = \pi (a^4 - \frac{1}{5}),$$